CS 210 - Fundamentals of Programming I
Spring 2019 - Programming Project 2
20 points

Out: January 29, 2019
Due: February 7, 2019 (Thursday)

Reminder: This is a programming project, and work on this assignment should be done individually. Assistance from other students is limited to questions about specific issues as noted in the syllabus.

Problem Statement

Many students get into computer science to write video games. For this problem, you are to develop a simple computer game that allows two users to play one match of Rock, Paper, Scissors, Lizard, Spock. In the traditional game of Rock, Paper, Scissor, players simultaneously choose one of the eponymous elements by flashing a hand gesture and comparing the results. The additional elements of Lizard and Spock were added by Sam Kass and Karen Bryla and popularized by the TV show *The Big Bang Theory*. The winner is chosen based on what winning action one element can do to another as follows:

- Scissors cuts Paper (i.e. Scissors beats Paper, etc.).
- Paper covers Rock.
- Rock crushes Lizard.
- Lizard poisons Spock.
- Spock smashes Scissors.
- Scissors decapitates Lizard.
- Lizard eats Paper
- Paper disproves Spock.
- Spock vaporizes Rock.
- Rock crushes Scissors.

If both players choose the same element, then the match is a tie.

Program Specifications

For this assignment, you are given the program specification in the form of an analysis and design for a series of functions that must be implemented to earn full credit for the project. Each function accomplishes one task needed for this program. You should write a function and then test it with a `main` program that ensures that the function works by itself. Once the function is working, move on to the next function, which will require a different `main` function to test it. Once all of the individual functions work, the final `main` function that actually plays the game is written.

Function: print_greeting

Analysis: no parameter or returned objects

Design: This function's task is simply to print out the greeting at the beginning of the program. See the sample run for the exact text format.

Function: get_pick

Analysis:

Objects	Type	Movement	Name
player's number	int	received	player_num
character user picked converted to uppercase	char	returned	ch

Design: This function's task is to prompt a (single) user by player number to enter either R for Rock, P for Paper, S for Scissors, L for Lizard, or K for Spock, and return the character entered in uppercase. Here are the steps to the accomplish this:
1. Ask the user by player number for an input of R, P, S, L, K
2. Read in the input
3. Convert the input to uppercase
4. Return the input

Notes:
- See the sample run for the exact text format of the prompt.
- Read the user's input using: `scanf(" %c", &ch);` Note there is a space before the `%` symbol. This will make `scanf` ignore any whitespace before the input.
- Convert `ch` to uppercase using the `toupper` function in the `<ctype.h>` library. Don't forget to include the library at the top of your file. The `toupper` function receives a character argument and returns the uppercase equivalent for alphabetic letters. If the argument is not a letter, the function returns the argument.

REMEMBER! Test this function (and all other functions) with a throwaway `main` function.

Function: print_picks

Analysis:

Objects	Type	Movement	Name
character picked by first user	char	received	player1
character picked by second user	char	received	player2

Design: This function's task is to print out what each user has picked. E.g. "Player 1 chose Rock", "Player 2 chose Paper". If a user's pick is not R, P, S, L, or K, it should print "Player chose Unknown". See the sample run for the exact text format.

Function: compute_winner

Analysis:

Objects	Type	Movement	Name
character picked by first user	char	received	player1
character picked by second user	char	received	player2
result	int	returned	-----

Design: This function's task is to return a number that represents the outcome of the match. It will return -1 if the first user wins, a 1 if the second user wins, and a 0 if the match is a tie. If a user's pick is not R, P, or S, then that user loses, unless both users' picks are invalid, then the match is a tie.

Main Program

Analysis:

Objects	Type	Name
character picked by first user	char	player1
character picked by second user	char	player2
winner of the match	int	winner

Design: Finally we arrive at the main function of the program, now that we have all the pieces.
1. Print the greeting using the print_greeting function
2. Get first user's pick using the get_pick function.
3. Get second user's pick using the get_pick function
4. Print out the players' picks using print_picks function
5. Determine the winner using compute_winner function
6. If the winner value is negative, print "Player 1 wins!"
7. If the winner value is positive, print "Player 2 wins!"
8. Otherwise, print "Tie!"
9. Return 0 to exit the program

Assignment

Write a C program that implements the game of Rock, Paper, Scissors, Lizard, Spock that allows two users to play. **Your program must follow the specifications given above to earn full credit.** That is, your program must define and use at least the specified functions. (The names of functions and variables do not have to be exactly the same, but the number and types of the parameters must be as specified.)

The output of the program must conform exactly to the following example runs (there are 4 separate runs shown; user input shown in **bold**). Note there is no blank line between the program heading and the user input prompts and there is a blank line before the first line of output. And as usual, there must be a newline after the last line of output.

```
Welcome to the RPSLK Game!
Let's play!!
Player 1, Pick (R)ock, (P)aper, (S)cissors, (L)izard, or Spoc(K): R
Player 2, Pick (R)ock, (P)aper, (S)cissors, (L)izard, or Spoc(K): p

Player 1 chose Rock
Player 2 chose Paper
Player 2 wins!
```

```
Welcome to the RPSLK Game!
Let's play!!
Player 1, Pick (R)ock, (P)aper, (S)cissors, (L)izard, or Spoc(K): s
Player 2, Pick (R)ock, (P)aper, (S)cissors, (L)izard, or Spoc(K): L

Player 1 chose Scissors
Player 2 chose Lizard
Player 1 wins!
```

```
Welcome to the RPSLK Game!
Let's play!!
Player 1, Pick (R)ock, (P)aper, (S)cissors, (L)izard, or Spoc(K): g
Player 2, Pick (R)ock, (P)aper, (S)cissors, (L)izard, or Spoc(K): K

Player 1 chose Unknown
Player 2 chose Spock
Player 2 wins!


Welcome to the RPSLK Game!
Let's play!!
Player 1, Pick (R)ock, (P)aper, (S)cissors, (L)izard, or Spoc(K): g
Player 2, Pick (R)ock, (P)aper, (S)cissors, (L)izard, or Spoc(K): h

Player 1 chose Unknown
Player 2 chose Unknown
Tie!
```

REMINDER: Your program must compile for it to be graded. Submissions that do not compile will be returned for resubmission and assessed a late penalty. Submissions that do not substantially work also will be returned for resubmission and assessed a late penalty.

Follow the program documentation guidelines in the *C Programming Style Guideline* handout. As stated in the syllabus, part of the grade on a programming assignment depends on how well you adhere to the guidelines. The grader will look at your code and grade it according to the guidelines. Be sure to run the Source code formatter (Astyle) plugin before you submit your program.

What to Submit
Electronically submit a zipfile containing **main.c** (only) as explained in class and in the handout *Submission Instructions for CS 210*. The submission system will start accepting assignments no earlier than the evening of Friday, February 1. Reminders: you may submit as many times as needed, and only the last submission will be graded. Assignments must be submitted by 11:59pm to earn full credit.